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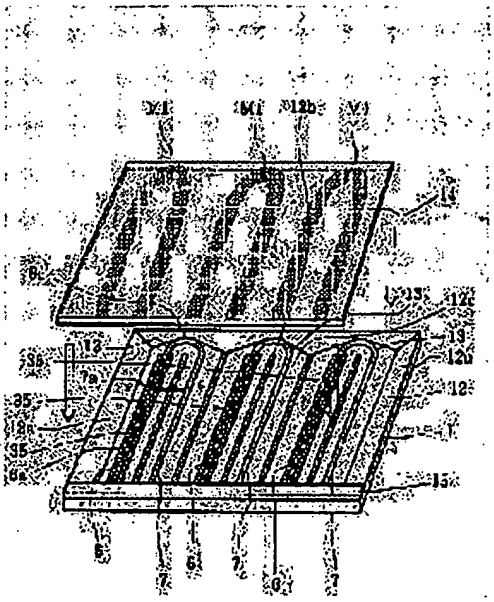
(54) BACK LIGHT UNIT

(57)Abstract:

PURPOSE: To efficiently improve brightness nonuniformity at a low cost by arranging a light source like a fluorescent lamp between a reflecting part for light and a first light diffusion member and locating a second light diffusion member to a part on the high pressure side of the light source.

CONSTITUTION: The reflecting part 12 of a case 11 is composed of white resin etc., to reflect the light of a neary U-shape fluorescent tube 13 to a diffusion plate 14 side. A masking pattern M1 in accordance with the shape of the tube 13 is pattern-printed by white ink, etc., onto the inner surface of the plate 14. A diffusion fluorescent tube cover 35 composed of material having an ultraviolet ray burning resistant characteristic such as polycarbonate is directly arranged in accordance with a part 6a corresponding to the high pressure side electrode 6 of the tube 13. Brightness nonconformity can be well improved at a



low cost by forming the cover 35 into a size of about the width or diameter of the tube 13. Also stengthening the squeeze of the pattern M1 can be eliminated to improve the margin of an forming position.

LEGAL STATUS

[Date of request for examination]

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The back light unit characterized by having the light source arranged between the reflective section of light, the 1st optical diffusion member which has a pattern for masking, and the above-mentioned reflective section and the optical diffusion member of the above 1st, and the 2nd optical diffusion member directly arranged corresponding to the bright section of the above-mentioned light source.
[Claim 2] Said light source is a back light unit according to claim 1 which is fluorescence tubing and by which the pattern for said masking of the consistency of homogeneity is formed in said 1st optical diffusion member corresponding to said light source.
[Claim 3] The bright section of said light source is a back light unit according to claim 2 which is a part corresponding to the high-tension-side electrode of said light source.
[Claim 4] Said light source is one or a back light unit according to claim 1 by which two or more arrangement is carried out.
[Claim 5] Said light source is a back light unit according to claim 1 to 4 which is a bend or a straight pipe.
[Claim 6] The light source of said bend is a back light unit according to claim 5 which is an about U character mold.
[Claim 7] The light source of said bend is a back light unit according to claim 5 which is a KO character type mostly.
[Claim 8] The back light unit according to claim 1 built in a liquid crystal display.
[Claim 9] Said 2nd optical diffusion member is a back light unit according to claim 1 or 2 currently made from the ingredient which has an ultraviolet-rays-proof burning property.
[Claim 10] Said 2nd optical diffusion member is a back light unit according to claim 9 which is a polycarbonate.
[Claim 11] The back light unit according to claim 1 to 3 by which the interlocking section which gears in said 2nd optical diffusion member at said light source is formed in one.
[Claim 12] For said 2nd optical diffusion member, said 2nd optical diffusion member is a back light unit according to claim 1 to 3 attached to said light source through the interlocking member of another object.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the back light unit for illuminating from back the liquid crystal display unit built in the liquid crystal display.
[0002]
[Description of the Prior Art] Conventionally, such a back light unit has composition as shown in drawing 19 . The conventional back light unit has the case 1 comparatively formed in the thin shape, and the fluorescence tubing 3 of two or more U character molds arranged at the front-face side of a reflecting plate 2 and this reflecting plate 2 is held in this case 1. The optical diffusion plate 4 is arranged to the case 1.
[0003] These fluorescence tubing 3 is turned on by the lighting circuit 5. The light which each fluorescence tubing 3 generates faces to the glory diffusion plate 4 reflected with the reflecting plate 2 toward the reflecting plate 2 toward the direct light diffusion plate 4. The optical diffusion plate 4 diffuses such light, and irradiates a front-face side as illumination light. Thereby, a back light unit illuminates from behind the liquid crystal display unit arranged at the front-face side, for example, floats the display, and raises visibility. However, if brightness nonuniformity is in the illumination light of this back light unit, the brightness of a liquid crystal display screen will become nonuniformity, and the contents of a display will become hard to see. For this reason, the illumination light of a back light unit needs to irradiate homogeneity over the whole screen of a liquid crystal display unit.
[0004]
[Problem(s) to be Solved by the Invention] However, the fluorescence tubing 3 is equipped with the high-tension-side electrode 6 (Hi side) and the low-tension side electrode 7 (Low side). Partial 6a (bright section) of the fluorescence tubing 3 corresponding to the high-tension-side electrode 6 by the electrical characteristics of the fluorescence tubing 3 is bright, and its partial 7a (umbra) of the fluorescence tubing 3 corresponding to the low-tension side electrode 7 is dark. That is, partial 6a corresponding to the high-tension-side electrode 6 of the fluorescence tubing 3 is high brightness compared with partial 7a corresponding to the low-tension side electrode 7.
[0005] Drawing 20 shows the brightness measure point which measures the brightness of each fluorescence tubing 3 in the case of having arranged in the case the diffusion plate which does not form the masking pattern. If luminance distribution is investigated about the measure point shown in the direction of an arrow head shown in drawing 20 , it will become like drawing 21 . That is, the partial 6a side corresponding to the high-tension-side electrode 6 of drawing 19 has high brightness, and the partial 7a side corresponding to the low-tension side electrode 7 has low brightness.
[0006] Then, in order to improve the brightness nonuniformity of such fluorescence tubing 3, as shown in drawing 19 , the masking pattern M is formed in white ink etc. on the diffusion plate 4, and brightness nonuniformity of each fluorescence tubing 3 is improved. In order to improve this brightness nonuniformity, the ratios of masking in partial 6a of the fluorescence tubing 3 corresponding to the high-tension-side electrode 6 and partial 7a of the fluorescence tubing 3 corresponding to the low-tension side

electrode 7 differ, the consistency of this masking pattern M has large partial 6a corresponding to the high-tension-side electrode 6, and partial 7a corresponding to the low-tension side electrode 7 is small. That is, since he is trying to crush the bright section of the fluorescence tubing 3, it has a consistency of an imbalanced pattern.

[0007] However, since equalization of brightness cannot fully be attained yet by this masking pattern M, it will be necessary to increase the thickness of the diffusion plate 4 corresponding to the partial 6a side of the fluorescence tubing 3 further, or to lower the transmission of the diffusion plate 4, and will lead to decline in the luminous efficiency of the illumination light in a back light unit. Moreover, although this masking pattern M usually consists of only dots, since it becomes impossible to be able to finish crushing the bright section of the fluorescence tubing 3, NEGAPOJI reversal will be carried out. Thus, it is necessary to make a masking pattern dense, to crush the bright section of the fluorescence tubing 3 more, and to equalize brightness with a sufficient precision.

[0008] When the formation location of the masking pattern in the diffusion plate 4 shifts from the location corresponding to the predetermined fluorescence tubing 3, it becomes an opposite effect on the contrary, and it becomes impossible however, to prevent brightness nonuniformity, when a masking pattern is made dense in this way. That is, the margin to the variation in the formation location of a masking pattern decreased, and there was a problem of becoming easy to generate brightness nonuniformity.

[0009] Then, this invention is made in order to cancel the above-mentioned technical problem, and it aims at offering the back light unit which can improve brightness nonuniformity efficiently at low cost.

[0010]

[Means for Solving the Problem] If the above-mentioned purpose is in this invention, it is constituted by the back light unit equipped with the light source arranged between the reflective section of light, the 1st optical diffusion member which has a pattern for masking, and the above-mentioned reflective section and the optical diffusion member of the above 1st, and the 2nd optical diffusion member directly arranged corresponding to the bright section of the above-mentioned light source. If it is in this invention, preferably, said light source is fluorescence tubing and the pattern for said masking of the consistency of homogeneity is formed in said 1st optical diffusion member corresponding to said light source. Moreover, if it is in this invention, the bright section of said light source is a part corresponding to the high-tension-side electrode of said light source preferably. furthermore -- if it is in this invention -- desirable -- said light source -- one -- or two or more arrangement is carried out. If it is in this invention, said light source is a bend or a straight pipe preferably. If it is in this invention, the light source of said bend is [whether it is an about U character mold and] a KO character type mostly preferably.

[0011] The back light unit of this invention is preferably built in a liquid crystal display. If it is in this invention, said 2nd optical diffusion member is preferably made from the ingredient which has an ultraviolet-rays-proof burning property. If it is in this invention, said 2nd optical diffusion member is a polycarbonate preferably. Moreover, if it is in this invention, the interlocking section which gears to said light source at said 2nd optical diffusion member is preferably formed in one. If it is in this invention, said 2nd optical diffusion member is preferably attached to said light source through the interlocking member of another object with said 2nd optical diffusion member.

[0012]

[Function] According to the above-mentioned configuration, by arranging the 2nd optical diffusion member directly corresponding to the bright section of the light source like fluorescence tubing, preliminary amendment of brightness nonuniformity is carried out, and the brightness nonuniformity of the light source is lost with the pattern for masking of the 1st optical diffusion member.

[0013]

[Example] Hereafter, the suitable example of this invention is explained to a detail based on an accompanying drawing. In addition, since the example described below is a suitable example of this invention, desirable various limitation is attached technically, but especially the range of this invention is not restricted to these modes, as long as there is no publication of the purport which limits this

invention in the following explanation.
[0014] Example 1 drawing 1 shows the desirable example of the back light unit of this invention. The back light unit of drawing 1 is equipped with three fluorescence tubing. The case 11 has the fluorescence tubing 13 of the 12 or 3 reflective sections, the lighting circuit 15, and three diffusion fluorescence tubing coverings 35.
[0015] To this case 11, the diffusion plate 14 which is the 1st optical diffusion member is arranged. An acrylic board and an opaque white plate can be adopted, and this diffusion plate 14 diffuses the light from [from that rear face (inside)] the fluorescence tubing 13 which carries out incidence, and irradiates a front-face side.
[0016] The reflective section 12 of a case 11 has reflecting plates 12a, 12b, and 12c etc. This reflecting plate 12b is the shape of for example, a cross-section crest type or a cross-section hemicycle. Moreover, reflecting plate 12a inclines. That front face is opened wide and this case 11 is a thin shape comparatively. The reflective section 12 can adopt what carried out white paint as metal plates, such as for example, white resin and aluminum, or this. This reflective section 12 can reflect in the diffusion plate 14 side the light which the fluorescence tubing 13 generates.
[0017] Each fluorescence tubing 13 is carrying out the about U character mold. Other than a U character mold, even if the fluorescence tubing 13 is a KO character type, of course, it is not cared about. Each fluorescence tubing 13 is turned on by the lighting circuit 15.
[0018] the diffusion plate 14 -- three masking patterns M1 are preferably formed in the inside. Each of this masking pattern M1 supports the configuration of the fluorescence tubing 13, respectively. The fluorescence tubing 13 has the high-tension-side electrode 6 and the low-tension side electrode 7. Each fluorescence tubing 13 contains partial 6a (bright section) corresponding to the high-tension-side electrode 6, partial 7a (umbra) corresponding to the low-tension side electrode 7, and bend 6c.
[0019] The masking pattern M1 of the diffusion plate 14 is preferably formed in the pattern consistency of homogeneity corresponding to this partial 6a, partial 7a, and bend 6c. In other words, the masking pattern M1 is the consistency of the same level corresponding to partial 6a, partial 7a, and bend 6c. The masking pattern M1 of this diffusion plate 14 is formed by pattern printing in for example, white ink, opalescence ink, or gray ink.
[0020] It is characteristic that the diffusion fluorescence tubing covering 35 is directly arranged corresponding to partial 6a corresponding to the high-tension-side electrode 6 called part containing the high-tension-side electrode 6 of each fluorescence tubing 13. the ingredient which this diffusion fluorescence tubing covering 35 is the 2nd optical diffusion member, for example, has an ultraviolet-rays-proof burning property -- it is preferably made by the polycarbonate etc.
[0021] Drawing 2 is in the condition which put the diffusion fluorescence tubing covering 35 on partial 6a of the fluorescence tubing 13, and, moreover, shows the measuring method of the luminance distribution of the fluorescence tubing 13 when not forming the masking pattern M1 to the diffusion plate 14. The measure point of the direction of arrow-head X comes to be shown in drawing 3 , when luminance distribution is measured. That is, in drawing 3 , luminance distribution is almost the same in partial 6a containing the high-tension-side electrode 6, and partial 7a containing the low-tension side electrode 7. This is because the diffusion fluorescence tubing covering 35 was formed in partial 6a.
[0022] Thus, by making it equip with the diffusion fluorescence tubing covering 35 directly to partial 6a corresponding to the high-tension-side electrode 6 of the fluorescence tubing 13, preliminary amendment of the brightness nonuniformity of the fluorescence tubing 13 can be performed, and the masking pattern M1 of the diffusion plate 14 can fully amend brightness nonuniformity further. That is, compared with amending brightness nonuniformity, too much dependence to pattern printing is avoidable with the pattern printing of the diffusion plate 14 like before. In order to attach the direct diffusion fluorescence tubing covering 35 in partial 6a corresponding to the high-tension-side electrode 6 of the fluorescence tubing 13, compared with the conventional thing which carried out pattern printing to the diffusion plate 14, and coped with it, there is the description that brightness nonuniformity cannot be easily conspicuous.
[0023] Since the amount of the dispersing agent 35 used called diffusion fluorescence tubing covering

will end if it is equivalent to the width of face of the fluorescence tubing 13, or the magnitude of diameter extent, it can improve brightness nonuniformity at low cost. Since there is no need of strengthening crushing of the masking pattern M1 by the side of partial 6a containing the high-tension-side electrode 6 unlike the former (a consistency being made high), there is no need for the NEGAPOJI reversal of a masking pattern performed conventionally, and **** that the brightness nonuniformity of fluorescence tubing will arise on the contrary is lost by a gap or variation of a masking pattern. Therefore, the margin of the formation location of a masking pattern is improved and the margin to the variation in the brightness of fluorescence tubing etc. is also improved.

[0024] Thus, the back light unit which stopped brightness nonuniformity is realizable with the thin shape of high brightness.

[0025] Drawing 4 is referred to in the secondary example. Drawing 4 shows another desirable example of the back light unit of this invention. One fluorescence tubing 13 is used for the example of drawing 4 . The reflective section 112, the lighting circuit 115, and one fluorescence tubing 13 are formed in the case 111. The reflective section 112 has reflecting plate 112a, reflecting plate 112b, and reflecting plate 112c by the side of a base.

[0026] The fluorescence tubing 13 is turned on by the lighting circuit 115. The fluorescence tubing 13 has the high-tension-side electrode 6 and the low-tension side electrode 7, and has partial 6a (bright section) corresponding to the high-tension-side electrode 6, partial 7a (umbra) corresponding to the low-tension side electrode 7, and bend part 6c. The optical diffusion plate 114 which is the 1st optical diffusion member is arranged to a case 111. The masking pattern M1 which has a consistency of uniform masking like the example of drawing 1 is formed in this diffusion plate 114, and the masking pattern M1 is preferably formed in the rear face of the optical diffusion plate 114 corresponding to the fluorescence tubing 13. And corresponding to partial 6a corresponding to the high-tension-side electrode 6 of the fluorescence tubing 13, the optical diffusion plate 35 called diffusion fluorescence tubing covering which is the 2nd optical diffusion member is arranged.

[0027] Drawing 5 shows the luminance distribution of the fluorescence tubing 13 in the condition of not forming the masking pattern M1 in partial 6a corresponding to the high-tension-side electrode 6 of the fluorescence tubing 13 in the condition of having arranged the diffusion fluorescence tubing covering 35 directly at the diffusion plate 114. The brightness of partial 6a corresponding to the high-tension-side electrode 6 and partial 7a corresponding to the low-tension side electrode 7 is almost the same so that clearly [in drawing 5].

[0028] An example 3, next drawing 6 are referred to. Drawing 6 shows still more nearly another desirable example of the back light unit of this invention. The case 211 has the fluorescence tubing 213 of the reflective section 212 and two straight pipe molds, the lighting circuit 215, and two diffusion fluorescence tubing coverings 235. The diffusion plate 214 called 1st optical diffusion member to this case 211 is attached. Corresponding to the fluorescence tubing 213, the masking pattern M2 of uniform distribution is formed in the diffusion plate 214.

[0029] The fluorescence tubing 213 of a straight pipe mold has partial 206a (bright section) corresponding to the high-tension-side electrode 206, and partial 207a (umbra) corresponding to the low-tension side electrode 207. The diffusion fluorescence tubing covering 235 which is the 2nd optical diffusion member is arranged at partial 206a corresponding to the high-tension-side electrode 206. By doing in this way, the brightness nonuniformity of fluorescence tubing is improvable like the example of drawing 1 , and the example of drawing 4 . As explained above, according to the example of this invention, the brightness nonuniformity of the part corresponding to the high-tension side of fluorescence tubing and the part corresponding to the low-tension side can be canceled nearly completely, and uniform back lighting without brightness nonuniformity is possible at low cost. And the lighting effectiveness of a back light unit is good, and even if the difference of light and darkness is severe fluorescence tubing, the improvement of brightness nonuniformity will be possible. Moreover, since a uniform masking pattern can be used, even if a masking pattern shifts from the position of fluorescence tubing somewhat, brightness nonuniformity cannot occur easily, and the margin to the variation in the location of fluorescence tubing and a masking pattern can be secured.

[0030] Other example drawing 7 thru/or drawing 18 shows the concrete example which attaches the 2nd optical diffusion plate. The case 11 of drawing 7 has the fluorescence tubing 13 of the 12 or 3 reflective sections, the lighting circuit 15, and three diffusion fluorescence tubing coverings 335. To this case 11, the diffusion plate 14 which is the 1st optical diffusion member is arranged.
[0031] As shown in drawing 7 and drawing 8 , the interlocking section 336,336 of a L character mold is formed in the diffusion fluorescence tubing covering 335 called diffusion sheet at one. by pushing this diffusion fluorescence tubing covering 335 from a top, as shown in drawing 9 , it can open along with the fluorescence tubing 13, and can engage in the fluorescence tubing 13, and it fixes, and the part of the foot of the interlocking section 336,336 can carry out location appearance of the diffusion fluorescence tubing covering 335 to the fluorescence tubing 13, and can use it as it. Then, the interlocking section 336,336 holds the fluorescence tubing 13 with the elasticity of the interlocking section 336,336.
[0032] In the example of drawing 10 , the interlocking section 436,436 is formed in the diffusion fluorescence tubing covering 435 at one. by pushing this diffusion fluorescence tubing covering 435 from a top, it can open along with the fluorescence tubing 13, and this interlocking section 436,436 can be engaged in the fluorescence tubing 13, and it fixes, and the part of the foot of the interlocking section 436,436 can carry out location appearance of the diffusion fluorescence tubing covering 335 to the fluorescence tubing 13, and can use it as it.
[0033] In the example of drawing 11 , it is approximately cylindrical, the part is opened wide, and the diffusion fluorescence tubing covering 535 serves as the interlocking section 536,536. In the example of drawing 12 , the interlocking section 636,636 is formed in the diffusion fluorescence tubing covering 635 at one. Thus, since diffusion fluorescence tubing covering and the interlocking section are one, it is cheap and diffusion fluorescence tubing covering can be easily fixed to the fluorescence tubing 13 by one-touch. Moreover, the amount of [from the reflective section] lobe is not, and it is hard to come to a luminescence side out of a shadow.
[0034] The case 11 of drawing 13 has the fluorescence tubing 13 of the 12 or 3 reflective sections, the lighting circuit 15, and three diffusion fluorescence tubing coverings 735. To this case 11, the diffusion plate 14 which is the 1st optical diffusion member is arranged.
[0035] As shown in drawing 13 and drawing 14 , the diffusion fluorescence tubing covering 735 and the interlocking member 737 are another object. This interlocking member 737 is engaged and held in the fluorescence tubing 13, and after that, the diffusion fluorescence tubing covering 735 is inserted in by the projection 738 of this interlocking member 737, and it fixes.
[0036] With the diffusion fluorescence tubing covering 835 of the example of drawing 15 , the slot 836 is further formed in the diffusion fluorescence tubing covering 735 of the example of drawing 14 . The projection 738 of the interlocking member 737 is attached in this slot 836.
[0037] The hole 936 is formed in the diffusion fluorescence tubing covering 935 of the example of drawing 16 , and the projection 938 of the interlocking member 937 is inserted in this hole 936. The hole 1036 is formed in the diffusion fluorescence tubing covering 1035 of the example of drawing 17 , and the projection 1038 of the interlocking member 1037 is inserted in this hole 1036.
[0038] In the example of drawing 18 , the direct interlocking member 1135 is fixed to the reflective section 12, and the diffusion fluorescence tubing covering 1135 is attached in this interlocking member 1135. Thus, a direct holder is made to be previously added to fluorescence tubing by using diffusion fluorescence tubing covering and the interlocking member as a holder as another object, since diffusion fluorescence tubing covering is inserted in this holder and it fixes to it, alignment of fluorescence tubing and diffusion fluorescence tubing covering is made firmly, and an ingredient or an ingredient of a different kind with an ingredient, a color, etc. of the same kind can be chosen. And when a holder is made into transparence, reflected in the diffusing surface is lost.
[0039] By the way, this invention is not limited to the above-mentioned example. For example, even if it arranges four or more fluorescence tubing not only in arrangement of 1 thru/or 3, of course, this invention is applicable. Moreover, even if fluorescence tubing is the thing of a U character mold or not only a straight pipe mold but a KO character type configuration, it is easy to be natural [tubing]. Moreover, this invention is applicable even if it is the light source of not only fluorescence tubing but

other classes as the light source.
[0040]
[Effect of the Invention] As explained above, according to this invention, brightness nonuniformity is efficiently improvable at low cost.

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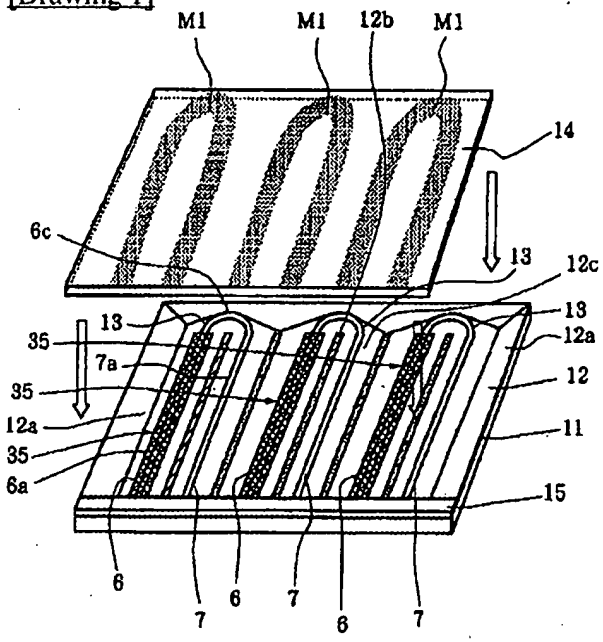
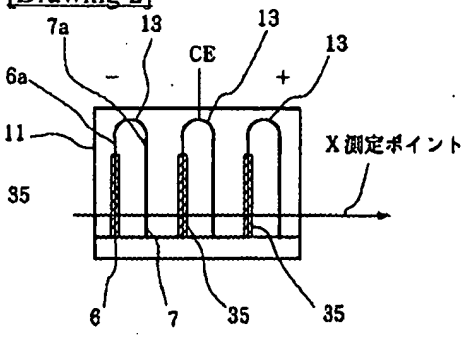
DRAWINGS

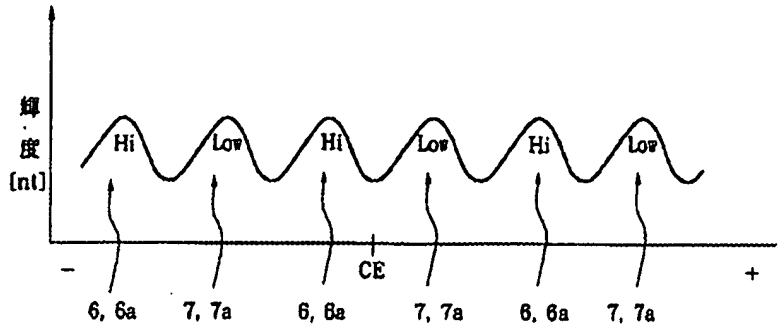
[Drawing 1]



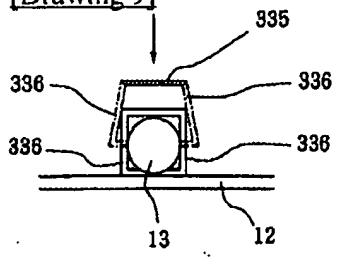
[Drawing 2]



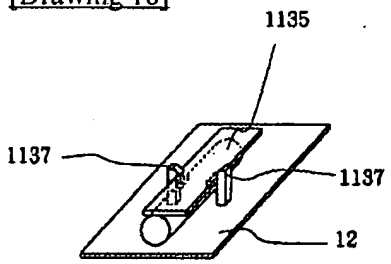
[Drawing 3]



[Drawing 9]



[Drawing 18]



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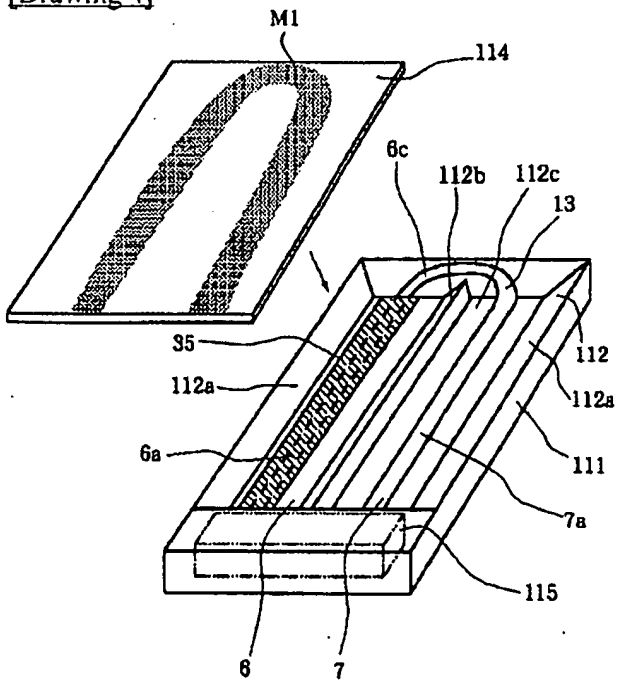

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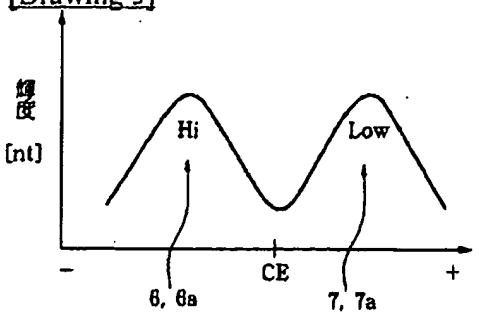

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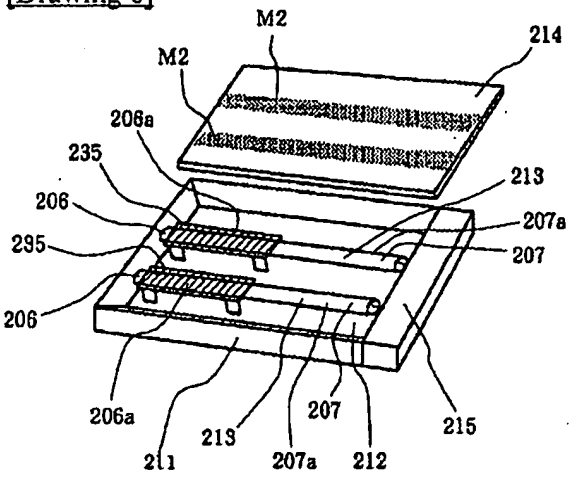

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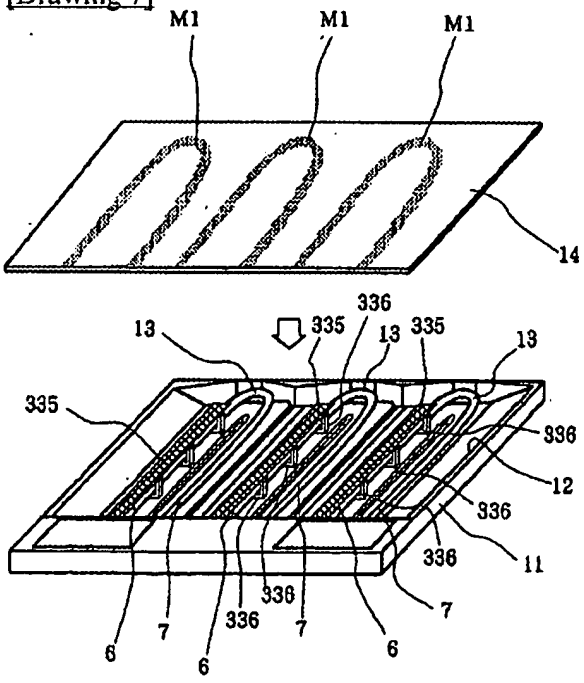

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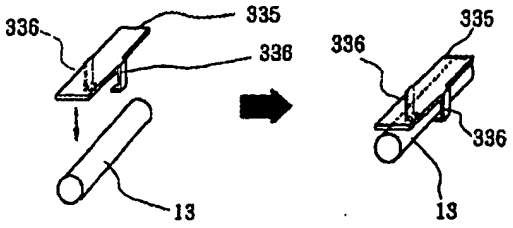

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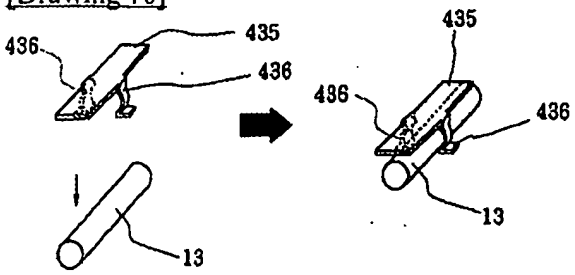

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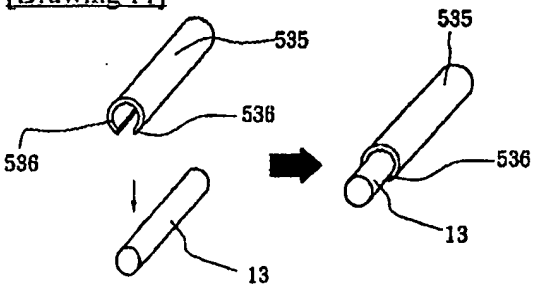
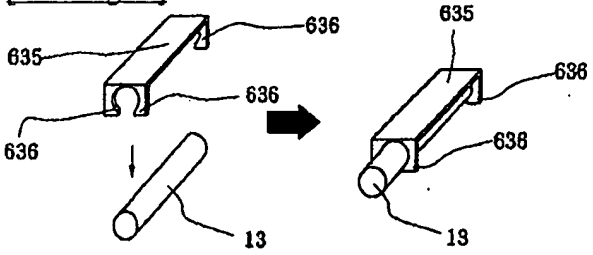
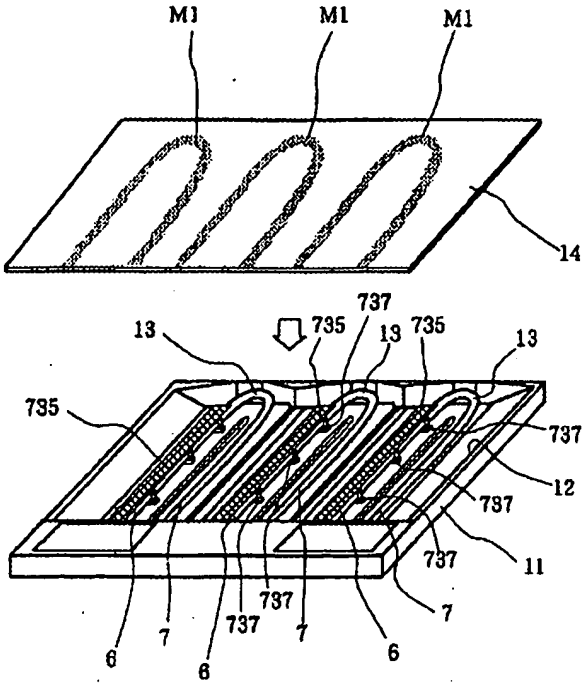


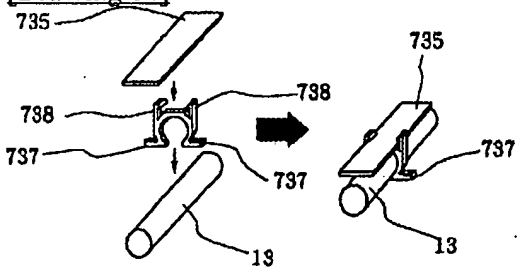
[Drawing 12]



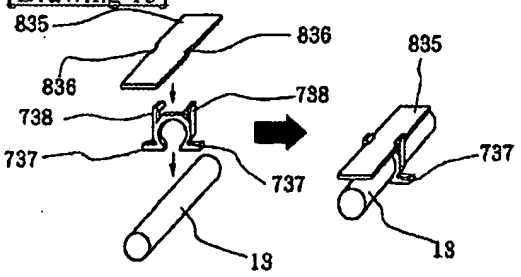
[Drawing 13]



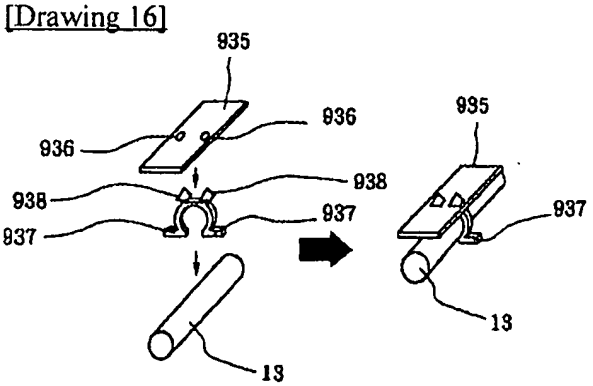
[Drawing 14]

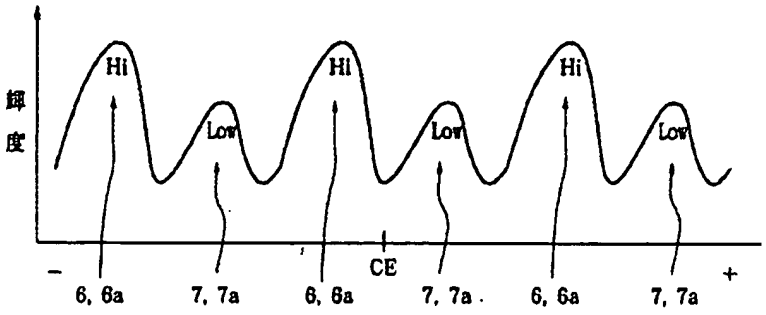


[Drawing 15]



[Drawing 16]





[Translation done.]